

(54) PERFORATING THERMOPLASTIC MATERIAL

(75) HORST IGNATZ

(21) 49 919/79

525 154

(22) 14.8.78

(23) 14.8.79

(24) 14.8.78

(43) 21.2.80

(44) 21.10.82

(51)² B26F 1/26
B29C 17/08

B26F 1/30

B29D 27/00

B31B 1/14

(74) GH

(56) 37 201/71 472 401 70.82 73.2

66 041/65

48.3-1

60 832/65

48.3-1 62.25

(57) Claim 1. A method of forming perforations in a heat-meltable material, the method comprising contacting the material with a peripheral surface of a rotatably mounted hollow drum having at least one recess in its peripheral surface, applying heat to at least a portion(s) of the material overlying the recess(es), while the drum is rotating, the heat being sufficient to melt said portion(s) and cause the molten portion(s) to perforate and the material thereof to flow towards the edge(s) of the recess(es), at the same time passing a cooling fluid axially through the drum so as to place the entire inner curved surface of the drum in heat exchange relationship with the cooling fluid and so as to maintain the surface temperature of the drum, and of the part of the material in contact therewith, below the melting temperature of the material, allowing the melted portions to solidify, and removing the material from the drum surface.

525154

Form 1
Regulation 9.

COMPLETE PATENT APPLICATION No. 49919/79.
COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1969

APPLICATION FOR A PATENT

49919/79

I/WE, HORST IGNATZ

of 75 Gibson Avenue, Padstow, N.S.W. 2211

RECEIVED	
Date	14.8.78
Receipt	PD 5481
Application	/
Declaration	/
Specification	7+7C
Drawings	3

hereby apply for the grant of a Patent for an
invention entitled "METHOD AND APPARATUS FOR PERFORATING
THERMOPLASTIC MATERIAL, AND PRODUCT THEREOF".

which is described in the accompanying provisional
specification.

APPLICATION ACCEPTED AND AMENDMENTS
ALLOWED J. 8. 82

~~My~~/my address for service is care of Griffith, Hassel &
Frazer, 323 Castlereagh Street, Sydney, New South Wales, 2000,
Australia.

Dated this 1st day of August, 19 78

HORST IGNATZ
By his Patent Attorney:

[Handwritten signature]

of GRIFFITH, HASSEL & FRAZER.

To: The Commissioner of Patents
Commonwealth of Australia.

10
1
MAIL OFFICE

BAD ORIGINAL

Form 6

Regulations 11(1)

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952

49919/79

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application made by me for a patent for an invention entitled:
"METHOD AND APPARATUS FOR PERFORATING THERMOPLASTIC
MATERIAL, AND PRODUCT THEREOF"

I, Horst Ignatz
(Full name)

, of (Full address)

60/78 GIBSON AVE. PADSTON NSW
2211

do solemnly and sincerely declare as follows:

1. I am the Applicant for the patent.
2. I am in possession of the invention, the subject of the application.
3. I am the actual inventor of the invention.

Declared at Sydney
(City and Country)

this 8TH

day of AUGUST 1978

Horst Ignatz
(Signature)

To:
The Commissioner of Patents
CANBERRA

NOTE: Initial all Deletions and Alterations.

BAD ORIGINAL

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1962-60

Form 10

COMPLETE SPECIFICATION

(CONFIDENTIAL)

4991972

FOR OFFICE USE :

Member :
Lodged :

Complete Specification Lodged :
 Accepted :
 Published :

city :

ated Art :

Class _____ Int. C _____

The document contains the
information made under the

and is covered by statute

no of Applicant :

TO BE COMPLETED BY APPLICANT
HORST IGNATZ

Tree of Applicant:

78 GIBSON AVENUE, PADSTOW NSW 2211

und Investor:

HORST IGHAFF

Press for Service:

**Quinn, Hann & Foner,
New York
235 Greenwich St.,
SYDNEY N.S.W. 2000 AUSTRALIA**

**AUSTRALIAN
14 AUG 1979
PATENT OFFICE**

plete Specification for the invention entitled:

"METHOD AND APPARATUS FOR PERFORATING THERMOPLASTIC MATERIAL, AND PRODUCT THEREOF"

following statement is a full description of this invention, with the best method of performing
own to me/USPC

BAD ORIGINAL

This invention relates to a method of and apparatus for perforating a material, and to a product when produced thereby.

5 This invention is particularly applicable to the making of perforations in thermoplastic synthetic resin materials such as polyethylene, polypropylene and the like.

10 More particularly, the invention relates to the making of perforations in sheet material such as of the kind used for packaging but it can also be applied to materials as in the form of, for example, tape or ribbon. One example of the use of perforated plastics sheet material is in the making of perforated bags used for packaging of precooked rice. In this example, the packaged rice is intended to be placed, while within the bag, in a pot of boiling water
15 prior to serving, the perforations permitting the water to permeate through the bag to the rice. When ready, the bag and its contents are simply removed from the pot and the rice is emptied from the bag ready to be served.

20 Conventionally, plastics sheet can be perforated by punching of the holes therein using a suitable punching machine. However this method has the very serious drawback that it results in the tear resistance of the plastics sheet being greatly reduced.

25 The present invention, however, provides a method and apparatus which is capable of forming perforations in a thermoplastic material in a way which avoids or at least significantly reduces the aforementioned drawback inherent in the conventional process of punching the perforations.

The method of the invention broadly comprises contacting the material with a peripheral surface of a rotatably mounted hollow drum having at least one recess in its peripheral surface, applying heat to at least a portion(s) of the material overlying the recess(es), while the drum is rotating, the heat being sufficient to melt said portion(s) and cause the molten portion(s) to perforate and the material thereof to ^{flow} expand towards the edge(s) of the recess(es) at the same time passing a cooling fluid ^{axially} through the drum to maintain the surface temperature of the drum, and of the part of the material in contact therewith, below the melting temperature of the material, allowing the melted portions to solidify, and removing the material from the drum surface.

While the method of the invention is particularly applicable to the perforation of material in the form of a thermoplastic resin sheet, it may also be applied to material in other forms provided that the material is capable of being melted and is in a form such that the part of the material in contact with the support surface can be maintained below its melting temperature by heat conduction to that surface.

Conveniently, heat may be applied to the material by means of a gas flame or equivalent means. The heat-meltable material may be in the form of a sheet of thermoplastic material which is fed continuously over the drum surface, with heat being directed towards the material on the drum at one location while the drum is rotating, whereby

perforations can be formed in the sheet in a substantially continuous manner.

10 An apparatus for carrying out the method in accordance with the invention broadly comprises a rotatably mounted hollow drum having at least one recess formed in a peripheral surface of the drum, means for rotating the drum, means arranged to bring the heat-meltable material into contact with the peripheral surface of the drum so that at least a portion(s) of the material overlies the recess(es), means arranged to apply heat to at least said portion(s) of the material while the drum is rotating so as to melt said portion(s) and to cause the molten portion(s) to perforate and the material thereof to ^{flow} expand towards the edge(s) of the recess(es), and means connected to the drum for passing a cooling fluid ^{axially} through the drum to maintain the surface temperature of the drum, and of that part of the material in contact therewith, below the melting temperature of the material.

20 In one embodiment of the invention the drum is cooled by passing a liquid coolant such as water through the interior of the drum. Preferably the outer drum surface is of a highly heat conductive material such as copper or aluminium.

The invention is to be understood to also extend to material which is perforated in accordance with the method, and/or by means of the apparatus hereinbefore defined.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:

Figure 1 is a schematic illustration of an apparatus for making perforations in thermoplastic sheet material;

Figure 2 is a vertical section taken along the line II-II of Figure 1;

Figure 3 is a section taken along the line III-III of Figure 1, and

Figure 4 is a partial enlarged view taken from Figure 3.

Referring to the drawings, the apparatus comprises a drum 10 journaled for rotation at its ends through bearings 11 and driven through a belt 12 by means of a motor 13.

As shown more clearly in Figure 4, which is a section through the cylindrical wall of the drum, this wall comprises an inner drum portion 10a and a perforated outer mantle 10b formed on or fitted to the outside of the portion 10a. The mantle 10b is formed with apertures 14 and is preferably made of a relatively highly heat conductive metal.

Referring to Figure 2, the interior of the drum is water tight and is fed with a water coolant through a feed pipe 15 which extends axially into the drum, so that water may circulate through the drum from the feed pipe 15 and out through a drain pipe 16 via a passageway 17 formed between

a portion of the pipe 15 and the interior wall of a hollow axle 18 extending at one end of the drum. A seal 19 is provided at one end of the axle, the seal being held between a flange 20 and a pipe connection member 21.

The bearing support 11 for the axle 18 of the drum comprises a roller bearing mounted on a stationary support 22. A similar arrangement rotatably supports an axle 23 at the opposite end of the drum.

A gas burner 24 is mounted below the drum surface in spaced relationship therewith, the burner producing a flame which extends in a line substantially the length of the drum. The gas burner is supplied with fuel through a tap 25 from a supply pipe 26.

As shown in Figure 3, a pair of rollers 27 are disposed adjacent the outer surface of the drum (the rollers not being shown in Figure 1) and arranged to guide a web 28 of thermoplastic sheet material about the outer surface of the drum. As the drum rotates heat from the burner 24 is applied to the thermoplastic material at the lower part of the drum and causes the portions of the thermoplastic material overlying the apertures 14 in the drum surface to melt and perforate. The part of the thermoplastic material, however, which is in contact with the metal surface of the drum is maintained below its melting temperature so that the melted portions each form a ring of melted material which solidifies into a form approximating the size and shape of the respective aperture or recess. The water circulates through the drum maintaining the outer surface of the drum at a suitably low temperature.

BAD ORIGINAL

The material leaving the drum surface is thereby formed with a plurality of perforations corresponding to the apertures in the drum surface. Unlike the perforations formed by a punching process, these are defined by a bead of solidified plastics material surrounding each perforation and serving to reinforce the sheet material to maintain a substantially high tear resistance. The apparatus is capable of producing the perforations at a relatively high rate in a simple but highly effective manner. In addition, the relative size and number of perforations can be varied by varying the apertures in the drum surface. Thus, for example the apertured mantle 10b may be in the form of a replaceable element which can be detachably fitted to the drum and replaced with a different mantle if different size perforations are required.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of forming perforations in a heat-meltable material, the method comprising contacting the material with a peripheral surface of a rotatably mounted hollow drum having at least one recess in its peripheral surface, applying heat to at least a portion(s) of the material overlying the recess(es), while the drum is rotating, the heat being sufficient to melt said portion(s) and cause the molten portion(s) to perforate and the material thereof to flow towards the edge(s) of the recess(es), at the same time passing a cooling fluid axially through the drum so as to place the entire inner curved surface of the drum in heat exchange relationship with the cooling fluid and so as to maintain the surface temperature of the drum, and of the part of the material in contact therewith, below the melting temperature of the material, allowing the melted portions to solidify, and removing the material from the drum surface.
2. A method as claimed in Claim 1 wherein the material comprises a thermoplastic resin sheet.
3. A method as claimed in Claim 1 or Claim 2 wherein the heat is applied by means of a gas flame, or heated gas.
4. An apparatus for forming perforations in a heat-meltable material, comprising a rotatable mounted hollow drum having at least one recess formed in a peripheral surface of the drum, means for rotating the drum, means arranged to bring the heat-meltable material into contact with the peripheral surface of the drum so that

150

BAD ORIGINAL

at least a portion(s) of the material overlies the recess(es), means arranged to apply heat to at least said portion(s) of the material while the drum is rotating so as to melt said portion(s) and to cause the molten portion(s) to perforate and the material thereof to flow towards the edge(s) of the recess(es), and means connected to the drum for passing a cooling fluid axially through the drum so as to place the entire inner curved surface of the drum in heat exchange relationship with the cooling fluid and so as to maintain the surface temperature of the drum, and of that part of the material in contact therewith, below the melting temperature of the material.

5. An apparatus as claimed in Claim 4 wherein the means for applying heat comprises a gas burner, or means for applying heated gas.

6. An apparatus as claimed in Claim 4 or 5 wherein the drum is connected to a source of liquid coolant and comprises a closed peripheral wall to contain the liquid coolant, a plurality of said recesses being formed in the outer surface of the drum but not extending fully through the wall of the drum, liquid inlet means located at one end of the drum and liquid outlet conduit means located at one end of the drum.

7. An apparatus as claimed in Claim 6 wherein the drum is rotatably supported on at least one axle on at least one side thereof, which axle is hollow and communicates with one of the inlet and outlet means, and a conduit passing through



the hollow axle and into the interior of the drum is connected with the other of the inlet and outlet means, the arrangement being such as to permit circulation of liquid coolant through the drum.

8. A method or an apparatus for forming perforations in a heat meltable material, substantially as herein described with reference to the accompanying drawings.

9. A thermoplastic resin sheet formed with perforations by the method of or using the apparatus of any one of Claims 1 to 8.

DATED this 2nd day of August, 1982.

HORST IGNATZ
By his Patent Attorney

John Tarry

of GRIFFITH HASSEL & FRANK

BAD ORIGINAL

49,919/79

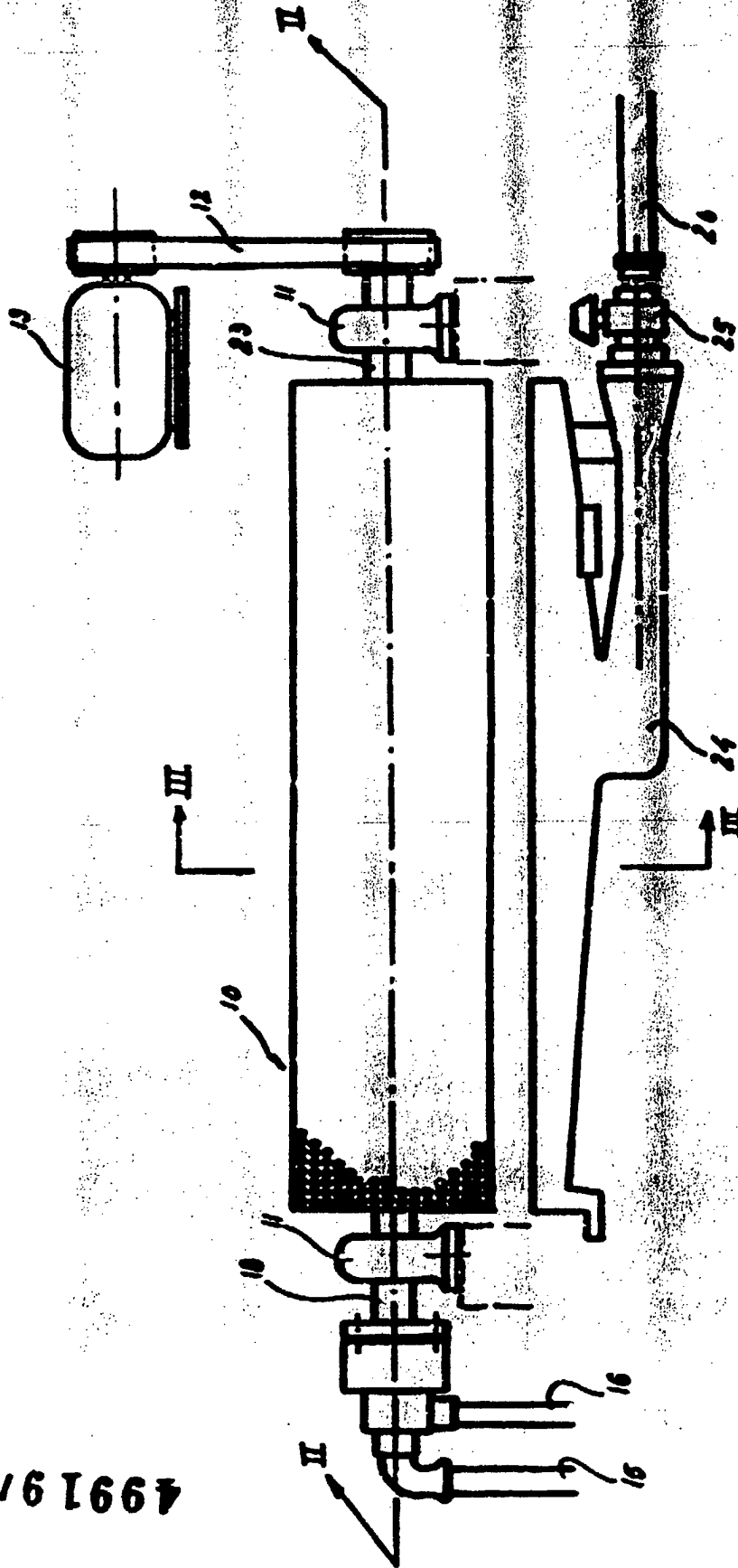


Fig. 1.

03684 038 43

49919/79

BAD ORIGINAL

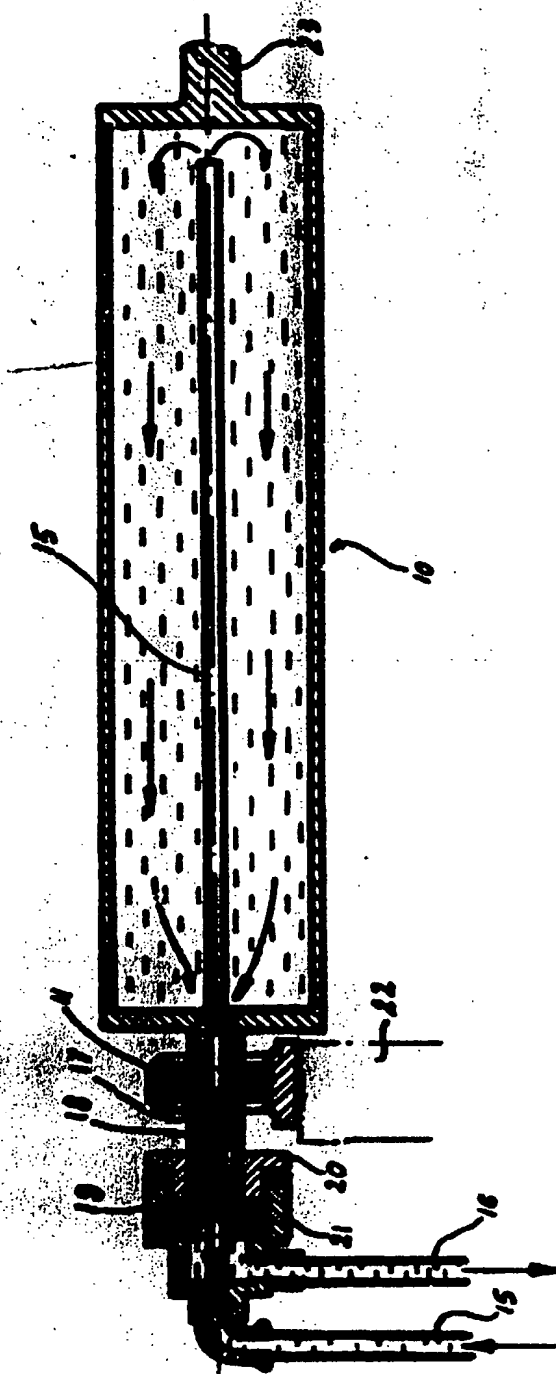


FIG. 2.

BAD ORIGINAL

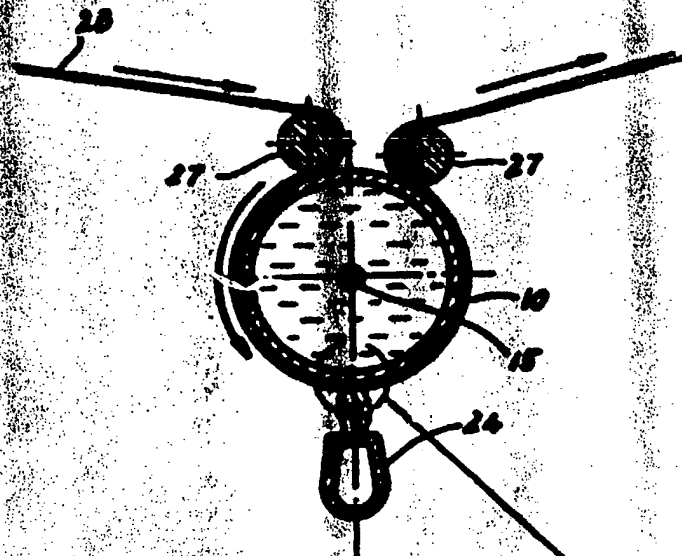


FIG. 3.

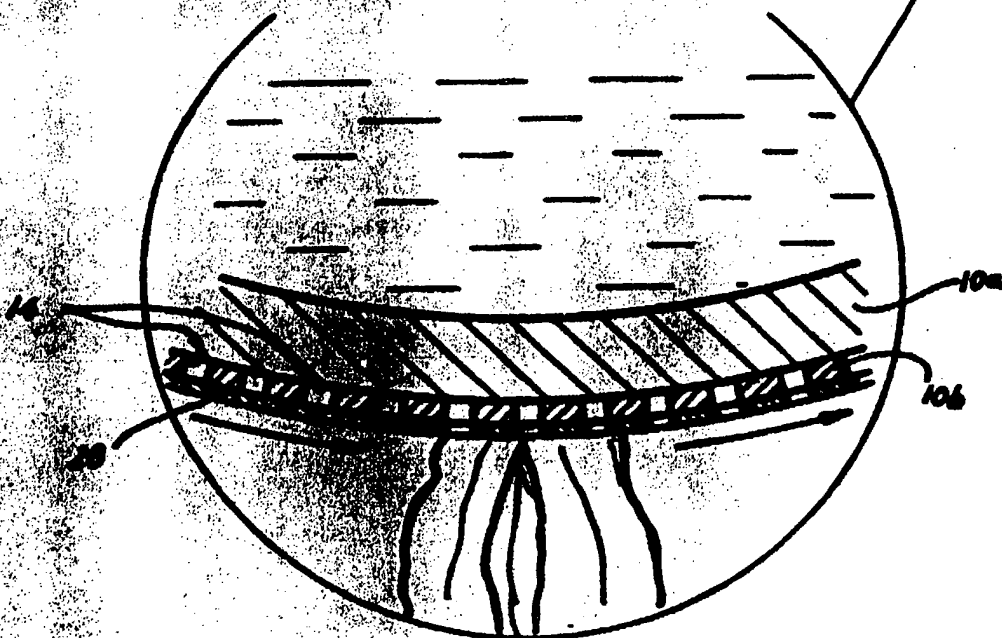


FIG. 4.

BAD ORIGINAL

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER: _____**

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

THIS PAGE BLANK (USPTO)